

NEW TAXA FOLLOWING A REASSESSMENT OF
ERIASTRUM SPARSIFLORUM (POLEMONIACEAE)

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ABSTRACT

A new species, *Eriastrum signatum* D. Gowen, is described for most plants previously identified as *E. sparsiflorum*, and a new combination, *E. harwoodii* (T. T. Craig) D. Gowen, is proposed for densely woolly plants having apiculate corolla lobes found in the eastern Mojave Desert. Additionally, both *E. sparsiflorum* and *E. tracyi* are discussed, and a key to *Eriastrum* with small stamens is provided.

Eriastrum sparsiflorum is a minutely glandular-pubescent annual plant limited to small areas in the southern Sierra Nevada, and along the eastern base of the Sierra in California and western Nevada. *Eriastrum sparsiflorum* has been misapplied to *Eriastrum signatum* and *E. tracyi*. *Eriastrum signatum* ranges from Oregon to southern California and western Nevada, and differs from *E. sparsiflorum* by having a dark maroon colored spot at the base of the corolla lobes and lacking glandular hairs. *Eriastrum tracyi*, which is presently placed in synonymy under *E. brandegeae*, warrants recognition as a distinct taxon. It occurs on coastal ranges of California, the western edge of the Modoc Plateau in northeastern Shasta County, as well as the southwestern Sierra Nevada.

Key Words: *Eriastrum*, Polemoniaceae.

In this paper, based on field and herbarium studies, I propose several changes to the taxonomy of *Eriastrum* Wootton & Standl from recent treatments (Mason 1945; Abrams 1951; Munz 1959; Patterson 1993). More than 1500 collections were examined at UC/JEPS and CAS, as well as RENO, PGM, and SBBG. A large percentage of these collections bear the annotations of Craig, Harrison, and Mason, three influential workers on the genus. These annotations reflect their interpretation of the genus. From most regions represented by the herbarium studies, plants were also observed in the field during the past four years. In addition, all but one of the taxa discussed in this paper, as well as many other *Eriastrum* taxa, have been grown during several seasons under common garden conditions in Oakland, California. Field samples and garden plants were especially useful in providing fresh material for corolla dissections and allowed observation of characters not always obvious with herbarium collections (e.g., flower color, stamen size and position). Based on these studies, I propose a new species previously included in *E. sparsiflorum* (Eastw.) H. Mason, a new combination, and the resurrection of *E. Tracyi* H. Mason. I also provide a key to these and morphologically similar *Eriastrum* taxa.

NEW SPECIES TREATMENT

Eriastrum signatum D. Gowen, sp. nov. (Fig. 1).
TYPE: U.S.A., CALIFORNIA, Kern Co.,
Frazier Mtn. Park Road west of Lebec, ca.
5.8 mi. west of I-5. Growing in granitic sand

between the road and stream. 21 June 2005,
David Gowen 346 (holotype: JEPS; isotypes
BRY, RSA).

A *E. sparsifloro* habitu eglandifero et unusquisque lobo corollae signo atropurpureo proximo basi differt.

Erect annual, to 35 cm high; stem sometimes simple, but often branching near the base, herbage lightly floccose; internodes 1–5 cm. *Leaves* light green, to 3 cm long, subulate-awn tipped, entire or some leaves with one pair of lobes, lobes to 8 mm long. *Flowering heads* few to many, floccose, 0.5–1.0 cm wide; bracts to 2.5 cm long, exceeding heads, with 1 or 2 pair of lateral lobes. *Calyx* 5–10 mm long, densely woolly, lobes unequal, tips not obscured by trichomes. *Corolla* regular, sub-salverform, 7–11 mm long, lobes pale blue to light pinkish blue, with a dark maroon colored, irregularly shaped spot near the base, and a yellowish throat, lobes elliptic, 2–4 mm long and 1–1.5 mm wide, throat plus tube 4.5–7 mm long, sinus to stamen insertion 0.5–0.75 mm. *Stamens* 1.5–2 mm long, filaments 1 mm long, anthers versatile, sagittate, 0.75–1 mm long. *Style* ca. 4–5 mm long, stigma 0.5–0.75 mm long. *Capsule* ca. 6 mm long and 2.5 mm wide, 3-loculed, seeds (1) 2 per locule.

Eriastrum signatum is the plant most often identified as *E. sparsiflorum*, and the most widespread of the four plants discussed in this paper. It can be recognized by its light blue to pale corolla lobes with the anthers exerted just beyond the sinus of the corolla lobes. The most useful characters distinguishing it from *E. sparsiflorum* are the presence of a dark maroon colored

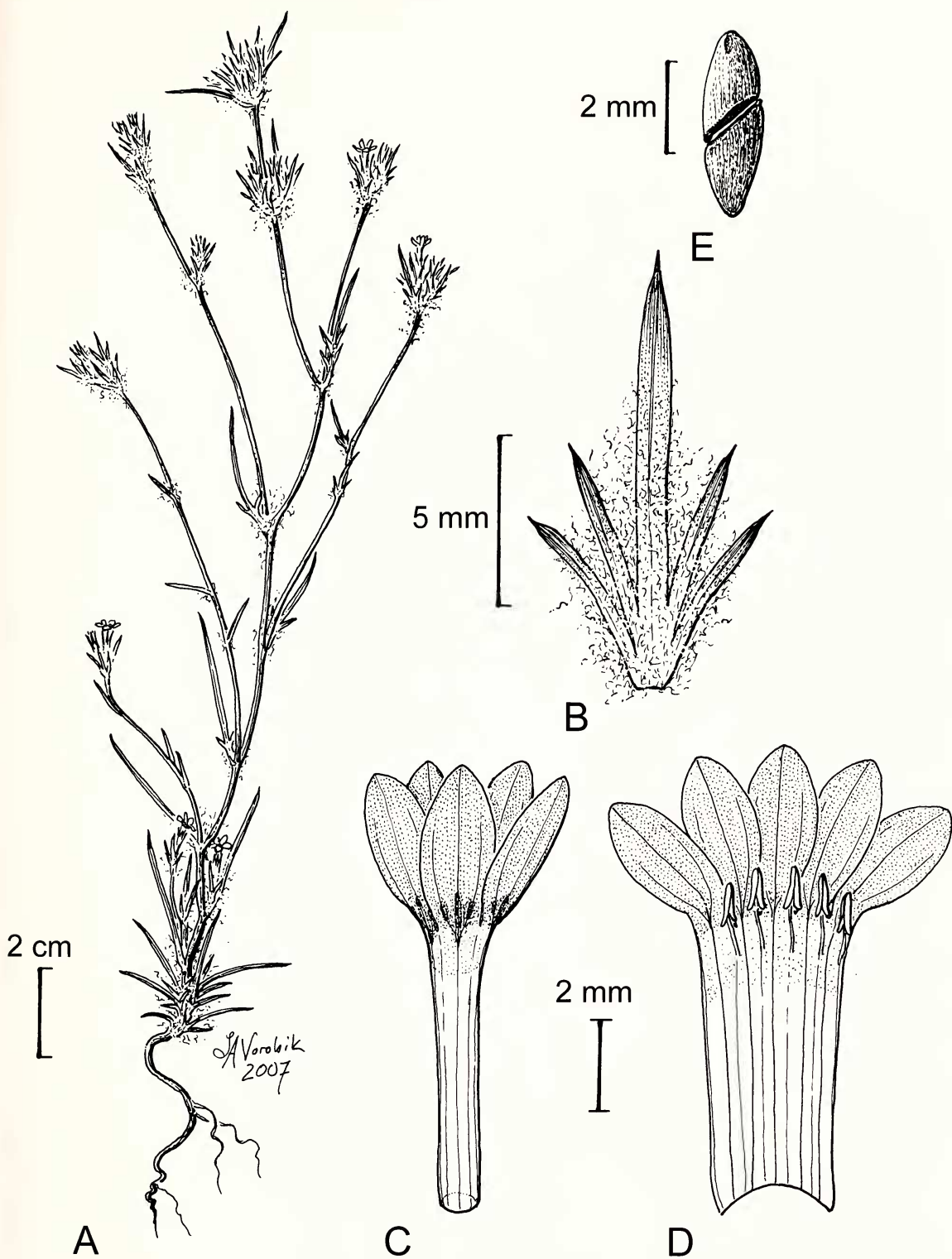


FIG. 1. *Eriastrum signatum*. A. Habit. B. Bract. C. Corolla. D. Dissected corolla. E. Seeds from one locule of the three-loculed capsule showing their orientation to each other.

spot centered near the base of each corolla lobe, and the lack of any glandular hairs on the plant. Although not every flower on a plant will have this spot, it is the prevalent condition. The specific epithet is derived from the Latin *signum*, meaning mark, or sign.

Eriastrum signatum is found from the Transverse Ranges in Ventura County, east to western San Bernardino County, north on the eastern side of the Sierra Nevada and western Nevada, into northeastern California and along the eastern side of the Cascade Range to central Oregon. Frequently, it is found in pinyon-juniper woodland. At several locations, it is sympatric with *E. sparsiflorum* (e.g., Canebrake Rd., Tulare Co.; near Woodfords, Alpine Co.; Mottsville, Douglas Co., Nevada), but it does not seem restricted to the granitic soils favored by *E. sparsiflorum*.

It is not uncommon to find more than one species of *Eriastrum* growing in close proximity (Craig 1934; Mason 1945). I have found this to be true with many different *Eriastrum* species, and of the many examples I have seen, there has been no detectable morphological evidence of hybridization.

Excluded from *Eriastrum signatum* are two similar plants that occur in southern portions of the inner Coast Ranges. These plants have corolla lobes with the same basic color pattern (i.e., blue with a dark spot at the corolla lobe base), but in other ways are not similar. Research is ongoing to determine their affinities. Plants found in San Benito, Monterey, and western Kern counties (e.g., *Gowen 117*, *Yadon s.n.*, *Twisselmann 1243*, *4466*, & *17808*) differ by having slightly longer filaments, attached lower in the corolla tube. Although Twisselmann (1967) cited his collections *1243* and *4466* as *E. hooveri*, it should be noted that they are not that species. Plants from San Luis Obispo Co. that Mason (1945) referred to *E. wilcoxii* (e.g., *Hoover 6162*, *Bacigalupi 5143*, *Gifford 830*), have longer, unevenly exerted stamens, and corolla lobes almost as long as the tube. Both of these plants have one seed per locule, compared to *E. signatum*, which usually has two.

Representative collections: California. Alpine Co.: Woodfords, *Bacigalupi & Heckard 6064* (JEPS); same area, *Gowen 649* (JEPS). Kern Co.: southwest of Lebec, *Weiler & Taylor 61110* (UC); west side of Walker Pass, *Gowen 621* (JEPS). Lassen Co.: Hallelujah Junction, *Gowen 656* (JEPS). Mono Co.: Wildrose Canyon, southeast of Glass Mtn., *Gowen 636* (JEPS). Siskiyou Co.: Lake Shastina, 19 July 1987, *A. Hale s.n.* (UC); same area, *Gowen 776* (JEPS). Tulare Co.: Canebrake Road, *Gowen 622* (JEPS). Ventura Co.: Mt. Pinos, *H. M. Hall 6580* (UC); upper Lockwood Valley, Mt. Pinos region, *Dudley & Lamb 4685* (UC); west of Lockwood Valley, 10 June 1947, *A. G. Vestal s.n.* (UC);

Cerro Noroeste Road west of Quatal Canyon Road, *Gowen 490* (JEPS). Nevada. Douglas Co.: Kingsbury Grade, southeast of Lake Tahoe, *Mason 12169* (UC); above Mottsville on Hwy 207, *Gowen 652* (JEPS).

Eriastrum signatum is the plant most often identified as *E. sparsiflorum*. These misidentifications have been the result of treatment authors basing their concept of *E. sparsiflorum* primarily on different plants than Eastwood's type collection.

The type of *Eriastrum sparsiflorum*, originally named *Gilia sparsiflora* by Eastwood (1902), is a plant she collected from along the Bubbs Creek trail in Kings River Canyon, Fresno County, California. She described her plant as being "minutely glandular-pubescent", an unusual character in a genus that is typically woolly. The only other *Eriastrum* that appear glandular are *E. sapphirinum* (Eastw.) H. Mason, and perhaps sometimes *E. eremicum* (Jeps.) H. Mason, and *E. pluriflorum* (A. Heller) H. Mason. Because flowers of these other plants have stamens almost as long as the corolla lobes, they are unlikely to be confused with *E. sparsiflorum*, which has short stamens exerted just beyond the sinus of the corolla. The vegetative portion of the plant does resemble *E. sapphirinum*, however. It is unclear whether the hair is actually glandular (i.e., forming a secretion), but the stubble-like appearance is readily discernable and helps provide a definitive means for recognizing *E. sparsiflorum*. These hairs are short, spreading, and only a few times longer than thick, compared to the more flowing floccose hairs of *E. signatum*. They can be found to varying degrees on most parts of the plant, but are generally most obvious on the upper stems and below the flowering heads. All the plants currently referable to *E. sparsiflorum* have this character, whereas none assigned to *E. signatum* do.

Mason (1945) defined *Eriastrum* as recognized today with species previously placed in *Navarretia*, *Gilia*, or *Hugelia*. Mason's work was a modification of the treatment by Craig (1934), and credited Craig with having made the first real organization of the genus. Craig included a description of *E. sparsiflorum*, which he called *Gilia filifolia* var. *sparsiflora*, and listed representative material from Washington, Idaho, Oregon, California, Nevada, and Baja California. The only collection from Fresno Co. mentioned was Eastwood's type collection. He noted that the Eastwood collection and plants from Mt. Pinos (Ventura County) represented a "rare race" of "two poorly defined races", and that "the other race" was "more woolly".

Mason's (1945) work did not offer much of a description for *Eriastrum sparsiflorum*, other than noting how it differed from *E. wilcoxii* (A. Nelson) H. Mason and *E. filifolium* (Nutt.) Wootton & Standl. He included an ideograph

representing the size of the corolla and stamens. Both *E. tracyi* and *E. brandegeae* were described as new (Mason 1945), each with a limited distribution in the inner North Coast Range of California. Craig had treated collections of these two taxa as "intergrades". Although Mason described the range of *E. sparsiflorum* as "East base of Cascades and Sierra Nevada, Tehachapi Mountains, and north on the west slope of the Sierra Nevada to Fresno County, California", the only representative specimens from California that he cited were two from Mt. Pinos in Ventura County. Both of these (Hall 6580, Dudley & Lamb 4685) are what I've treated here as *E. signatum*. Mason did include his own collection from Nevada (Mottsville, Mason 12362), which is one of the few collections matching the type of *E. sparsiflorum*.

Following Mason's work, most of the major floras (e.g., Abrams 1951; Munz 1959; Hickman 1993), as well as a treatment of the genus by Harrison (1959, 1972), have echoed Mason with only minor changes. Harrison's (1959) treatment of *E. sparsiflorum* included a longer list of representative collections covering similar regions as had Craig, but additionally included Howell 16142, and Rose 40675, both made in the 1940's. These two are from near the type area in Fresno Co. The Howell collection is *E. sparsiflorum*, but the Rose collection is *E. tracyi*. The drawings of dissected corollas that Harrison (1959, 1968) presented to illustrate *E. sparsiflorum* are from material collected from Nevada just east of Lake Tahoe (Mason 12169). This collection however, is *E. signatum*, not *E. sparsiflorum*.

What is evident from the works of these authors is that their concept of *E. sparsiflorum* was based primarily on a different plant than is represented by Eastwood's type collection. This can also be observed by the annotations made by these authors on herbarium collections. None of the treatments prepared by these authors included Eastwood's description of the plant as being "glandular-pubescent".

ERIASTRUM SPARSIFLORUM

Eriastrum sparsiflorum (Eastw.) H. Mason, *Madroño* 8: 86. 1945.—*Gilia sparsiflora* Eastw., *Proc. Calif. Acad.* III, 2: 291. 1902.—*Navarretia filifolia* Kuntze subsp. *sparsiflora* Brand in Engler, *Pflanzenreich* IV, 250: 167. 1907.—*Gilia filifolia* Nutt. var. *sparsiflora* J. F. Macbr., *Contr. Gray Herb.* 49:57. 1917.—*Hugelia filifolia* var. *sparsiflora* Jepson, *Man. Fl. Pl. Calif.* 792. 1925.—Type: U.S.A., California, Fresno Co., Bubbs Creek, South Fork of Kings River, 1–13 July 1899, Alice Eastwood s.n. (holotype: CAS!).

As described by Eastwood (1902), *E. sparsiflorum* is "minutely glandular-pubescent". The

floral heads tend to have a narrow appearance, with few flowers per head, as the name implies. The whole plant, which is generally much taller than *E. signatum*, appears sparse and elongated.

Before seeing these plants in the field, I had surmised that Eastwood's collection had possibly grown in the shade and was not representative of the plant in more natural conditions. I have since seen the plant growing in exposed sites and the flowers are still few and the floral heads are narrow. The bracts and leaves are often without lobes, or the lobes are short and barely angled away from the axis. An excellent drawing that illustrates the distinctive habit of *E. sparsiflorum* compared to *E. signatum* can be found in Harrison (1972). This drawing shows the type of *E. sparsiflorum* (Eastwood s.n.) as well as two collections of *E. signatum*, one from the Mt. Pinos region (Twisselmann 2316), the other northeastern California (Bacigalupi & Robbins 5417).

The corollas of *Eriastrum sparsiflorum* are uniformly pale whitish with a slight tint of blue or lavender. They have the appearance of being white, compared to *E. signatum*, which generally appears light blue. (On several flowers I have found a barely perceptible dark fleck or two at the base of the corolla lobe that hints of the more obvious pattern of *E. signatum*, but such flowers are rare, and thus are unlikely to be encountered.) The throat is slightly widened and the stamens are exerted about two anther lengths beyond the sinus of the corolla lobes in *E. sparsiflorum*. Eastwood described the flower as "white with some purple dots in the funnel-form throat".

Eriastrum sparsiflorum H. Mason has been generally thought to be a widespread species, found from central Oregon to southern California and western Nevada. However, only a handful of herbarium collections identified as *E. sparsiflorum* match the type of the species. (Most specimens that I examined were *E. signatum*.) Based on specimens matching the type specimen, the distribution of *Eriastrum sparsiflorum* includes scattered locations in the southern Sierra Nevada of Fresno, Tulare, and northeastern Kern counties. It also occurs at the eastern base of the Sierras in Inyo County, the northwestern base of the White Mountains in Mono County, then north along eastern Alpine County and the western edge of Nevada to southeastern Lassen County. Most often it is found in granitic sand, frequently in sagebrush scrub.

Representative collections: California. Alpine Co.: near Woodfords, *Gowen 648* (JEPS). Fresno Co.: Kings River Canyon, Zumwalt Meadows, *J.T. Howell 16142* (CAS). Inyo Co.: 7 mi. south of Bishop, *Duran 1466* (UC); Keough Hot Springs Road, *Gowen 641* (JEPS). Kern Co.: 8 mi. west of Walker Pass, Hwy 178, *Shevock 999*

(CAS). Lassen Co.: Red Rock Road, south of Constantia, *Gowen 657* (JEPS). Mono Co.: near mouth of Queen Dick Canyon, *Morefield & McCarty 3767* (UC); mouth of Marble Creek 4.4 mi. S 56° E of Benton, *Morefield & McCarty 4028* (UC); Benton, *Gowen 646* (JEPS). Tulare Co.: about 1 1/4 mi. north of Soda Spring on Freeman Creek, near trail to Jerky Meadow, *C.N. Smith 1222* (JEPS); base of Church Dome, along FS 34E08, *Shevock 8991* (CAS); Kennedy Meadows, *Twisselmann 7860* (CAS, SBBG). Nevada. Ormsby Co.: Eagle Valley, *C. F. Baker 1403* (UC). Douglas Co.: Mottsville, *Mason 12362* (UC); above Mottsville, near Hwy 207, *Gowen 651* (JEPS).

ERIASTRUM TRACYI

Eriastrum tracyi H. Mason, *Madroño* 8: 87. 1945.
—Type: U.S.A., California, Trinity Co.: Hayfork Valley, 30 June 1923, *J.P. Tracy 6463* (holotype: UC!; isotypes JEPS! UC!).

Recently *E. tracyi* has been considered a synonym of *E. brandegeae* (Patterson 1993). Patterson did not elucidate his reason for synonymizing *E. tracyi*, but he was likely following comments made by Harrison (1959, 1972). Harrison (1959) maintained *E. tracyi* as a distinct entity “with considerable hesitancy” until “a second collection is made in the area that may substantiate the distinction”. At the time of writing, Harrison believed that only the type collection, and possibly the disjunct *Sharsmith 3299* collection from Santa Clara County, represented *E. tracyi*. *Eriastrum tracyi* is frequently misidentified to *E. sparsiflorum*, especially when found in the southern Sierra Nevada, where it previously was not known to occur. Several collections annotated as *E. sparsiflorum* by Harrison are *E. tracyi* (e.g., *Rose 40675*, *L.R. Short S-208*).

The distinctions between *E. tracyi* and *E. brandegeae* are subtle and additional work is needed to better understand their relationship. *Eriastrum tracyi* has shorter stamens and wider corolla lobes. Collections from their type locations, as well as garden plants grown from those collections can be separated on this basis. Plants found geographically between these two areas (i.e., in Colusa and Glenn counties) are more problematic. Several distinct forms are found, but they do not seem to show a definable gradation between the two species. Future molecular work might provide a better understanding of this group.

The small anther size, short, mostly included stamens (they just reach the corolla sinus), and corolla lobe shape unite plants from the southwestern Sierra with *E. tracyi* found in the type area of Trinity County. Plants found in Santa Clara County (e.g., *Sharsmith 3299*), as well as

northeastern Shasta County also appear to belong here. In the southwestern Sierra Nevada it occurs in Kern, Tulare, and Fresno counties, most often associated with chaparral communities. In the Kings River Canyon it is found not far from the type area of *E. sparsiflorum*.

The corollas of *Eriastrum tracyi* are blue to almost white. Most often they have a yellow to white throat above the blue in the upper portion of the tube. The corolla is less widened in the throat and the lobes are shorter and wider compared to *E. signatum* and *E. sparsiflorum*. There is no spot at the corolla lobe base. *Eriastrum tracyi* usually develops only a single seed per locule, although the Sierra plants occasionally will develop two. Both *E. sparsiflorum* and *E. signatum* have two seeds (or rarely one) per locule.

Representative collections: California. Fresno Co.: Kings River Canyon, junction of Middle & South Fork, *Rose 40675* (CAS, UC); along California Hwy 180, 0.1 mi. west of Ten Mile Creek, Sequoia National Forest, *Shevock 8774* (CAS); Bell Fire Rd., east of Auberry, *Gowen 480* (JEPS). Kern Co.: Poso Creek near Poso Mine, *C.N. Smith 1* (UC); on Greenhorn, about 6 mi. from head of Eugene Grade, *C.N. Smith 1043* (JEPS); Havilah Ranger Station, *L.R. Short S-208* (UC); hill just east of Bodfish Gap, *Twisselmann 12149* (CAS). Santa Clara Co.: Arroyo Bayo, 17 June 2003, *Gowen s.n.* (JEPS). Shasta Co.: Fall River Mills-Cassell Rd., *Oswald 9561* (JEPS); same area, *Gowen 783* (JEPS).

NEW COMBINATION IN *ERIASTRUM*

Eriastrum harwoodii (T. T. Craig) D. Gowen, stat. et comb. nov. —*Gilia filifolia* var. *harwoodii* T. T. Craig, *Bull. Torrey Bot. Club* 61: 424–425. 1934. —*Hugelia diffusa* var. *harwoodii* Jepson, *Fl. Calif.* 3: 167. 1943. —*Eriastrum diffusum* subsp. *harwoodii* (T. T. Craig) H. L. Mason, *Madroño* 8: 77. 1945. —*Eriastrum sparsiflorum* subsp. *harwoodii* (T. T. Craig) H. K. Harrison, *Phytomorphology* 18: 401. 1968. —Type: U.S.A., California, Riverside Co., sandy desert 1200 ft., Blythe Junction, 2 April 1920, *Munz & Harwood 3589*, (holotype: POM!).

Eriastrum harwoodii was treated as a variety or subspecies of *Gilia filifolia*, *E. diffusum* (A. Gray) H. Mason, and *E. sparsiflorum*, before being placed in synonymy under *E. sparsiflorum* by Patterson (1993). As noted in the discussion above, previous workers based their understanding of *E. sparsiflorum* on *E. signatum*. Rather than now moving *E. harwoodii* to either *E. signatum* or *E. sparsiflorum*, it is elevated to species level because it is morphologically, ecologically, and geographically distinct from the other two species. This proposal parallels the treatment of *E.*

diffusum and *E. sparsiflorum*, also formerly treated as varieties under *Gilia filifolia*, and subsequently elevated to species status.

The entire plant of *Eriastrum harwoodii* is conspicuously woolly, in marked contrast to *E. sparsiflorum*, which is minutely glandular-pubescent, or *E. signatum*, which is sparsely floccose. The flower is straw yellow or whitish with apiculate corolla lobes. The corolla lobes are shorter and wider than *E. sparsiflorum* or *E.*

signatum. *Eriastrum harwoodii* occurs outside the ranges of both, being known only from sandy desert areas of eastern San Bernardino and Riverside counties.

Representative collections: California. Riverside Co.: 3 mi. south of Rice on Blythe Road, Wolf 3119 (UC). San Bernardino Co.: Kelso, June 1915 *Brandegee s.n.* (UC); Dale Dry Lake, P. A. Munz 15690 (UC); slopes south of Dale Dry Lake, Bacigalupi 6240 (JEPS).

KEY TO ANNUAL *ERIASTRUM* WITH STAMENS EXsertED LESS THAN 1/2 COROLLA LOBE LENGTH

1. Anthers exerted beyond sinus of corolla.
 2. Stamens unequal, longest filament twice or more the length of the anther; leaves often 3–5-lobed *E. wilcoxii*
 - 2' Stamens equal, filaments less than twice the length of the anther; leaves often entire.
 3. Plant minutely glandular-pubescent. *E. sparsiflorum*
 - 3' Plant floccose to woolly, not minutely glandular-pubescent.
 4. Corolla lobes light blue, with dark colored spot at base, rounded apically; mainly of pinyon-juniper woodland *E. signatum*
 - 4' Corolla lobes straw yellow or whitish, without dark colored spot at base, apiculate apically; mainly of creosote bush scrub *E. harwoodii*
- 1' Anthers below or just at the sinus of corolla.
 5. Upper leaves and bracts pinnately 3–7-lobed; inflorescences many flowered, densely bracteate, dense wool matted at base *E. abramsii*
 - 5' Upper leaves and bracts 1–3-parted, or palmately 5-lobed; inflorescences few flowered, bracts few, loosely woolly.
 6. Corolla 7–10 mm long, blue to lavender or white; seeds 1(–2) per locule.
 7. Corolla light blue to white, lobes 1.2–1.5 mm wide (length = 2× width); stamens 0.75–1.5 mm long, filaments equal anther length *E. tracyi*
 - 7' Corolla light blue to lavender, lobes 0.9–1.1 mm wide (length = 3× width); stamens 1.5–2 mm long, filaments twice anther length *E. brandegeae*
 - 6' Corolla 5–7 mm long, white; seeds 2–4 per locule. *E. hooveri*

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